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DOI: <https://doi.org/10.1007/s00059-009-3274-x>

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ZORA URL: <https://doi.org/10.5167/uzh-25560>

Journal Article

Published Version

Originally published at:

Donati, O F; Stolzmann, P; Leschka, S; Simmen, H P; Marincek, B; Alkadhi, H; Scheffel, H (2009).
Magnetic resonance imaging of cardiac contusion. *Herz*, 34(7):562-563.

DOI: <https://doi.org/10.1007/s00059-009-3274-x>

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Magnetic Resonance Imaging of Cardiac Contusion

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Herz 2009;34:562–3
DOI 10.1007/
s00059-009-3274-x

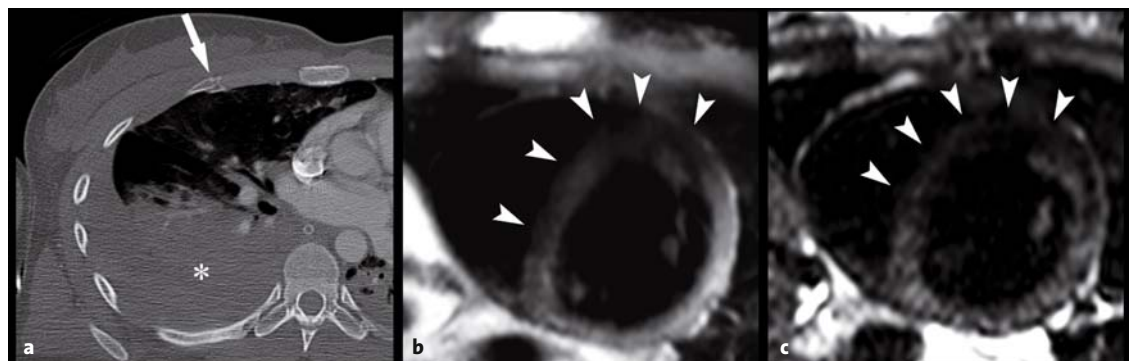
Even though cardiac contusion is the most common injury to the heart after blunt chest trauma, its diagnosis remains challenging. In contrast to cardiac concussion, where usually no pathologic changes of the heart or thoracic cage are found, cardiac contusion is characterized by structural abnormalities including damage of the thoracic cage and the myocardium. In this case report, we demonstrate how cardiac magnetic resonance imaging (CMR) can visualize myocardial abnormalities and may hereby help establishing the diagnosis of cardiac contusion.

We present the case of a 35-year-old female patient who was admitted to our emergency department following a vehicle accident. The patient had been found in her car with a Glasgow Coma Scale of 3 after a frontal collision into a wall. Paramedics at the scene diagnosed cardiac arrest and successfully resuscitated the patient. On arrival at our emergency department, computed tomography of the chest was performed that showed multiple rib fractures, a right-sided hemothorax, and lung contusions on both sides (Figure 1a). Electrocardiography (ECG) showed prolonged QTc time of 490 ms, possible epsilon wave in V₁ and V₂ as well as terminally negative T in V₂. Initial troponin T was normal, increased to 0.35 µg/l after 5 h, and returned to normal values after 20 h. MB isoenzyme of creatine kinase (CK-MB) showed a peak of 149 U/l 5 h after the accident. Her medical history was unremarkable. The patient underwent

catheter coronary angiography which showed normal coronary arteries with no evidence of coronary artery disease.

Because of the ECG changes, CMR was performed 36 h after the accident with the question of arrhythmogenic right ventricular dysplasia, which could be reliably excluded. Images in black blood technique revealed hypointense signal on T1-weighted (T1w) and on T2w images in midventricular and basal anterior as well as anteroseptal myocardial segments (Figures 1b and 1c). Considering the time interval of 36 h between vehicle accident and CMR, these signal characteristics most probably reflect intracellular deoxygenated hemoglobin [1]. Steady-state free precession (SSFP) cine images demonstrated dyskinesia in the corresponding region. Delayed-enhancement imaging 10 min after the administration of 0.2 mmol/kg of Gd-DOTA showed no late myocardial gadolinium uptake. Due to the absent delayed enhancement and negative catheter coronary angiography, myocardial infarction as the underlying cause of the motor vehicle accident was excluded. Instead, the diagnosis of myocardial hemorrhage following a traumatic cardiac contusion with ventricular fibrillation was made. The subsequent clinical course of the patient was uneventful, and she was discharged home after 13 days.

Cardiac contusion is the most common injury to the heart after blunt chest trauma. Unfortunately,



Figures 1a to 1c. Chest computed tomography (a) showing a right-sided rib fracture (arrow) and extensive hemothorax (asterisk). T1w black blood images (b) demonstrate transmural hypointense signal of the midventricular anterior and anteroseptal myocardial segments of the left ventricle (arrowheads). The hypointense area indicating myocardial hemorrhage is also detectable on T2w black blood MR images (c).

there is no gold standard test for the diagnosis of cardiac contusion making the clinical diagnosis a challenge. Laboratory tests and ECG findings are neither sensitive nor specific [2], and patients often remain asymptomatic. The cause of cardiac contusion usually is a violent blow to any portion of the chest with structural damage to the osseous thoracic cage [3]. According to the literature [4], cardiac contusion may lead to fatal complications such as cardiac arrest necessitating resuscitation. In contrast to cardiac concussion, where usually no gross or microscopic pathologic changes of the heart or thoracic cage are found, cardiac contusion is characterized by structural abnormalities including patchy necrosis, edema, and hemorrhage [5].

This case demonstrates that CMR can be a sensitive modality for demonstrating intraparenchymal hemorrhage [1, 6] and therefore may be a valuable supplement in the diagnosis of cardiac contusion.

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